

THE
LEAF
ANTHOLOGY
of Urban Environmental Education



*Teaching Resources for
the Urban Environmental High School Teacher*

*Edited by Dan Strauss
LEAF Education Manager*

S U B M I T T E D B Y

NEW YORK NATURAL HERITAGE PROGRAM

Albany, New York

iMapInvasives is a network of states that provide tools for gathering and sharing invasive species information for citizen scientists and natural resource managers. Students can make valuable contributions to their state by collecting and contributing data using spatial technology. In New York, iMapInvasives is coordinated by the New York Natural Heritage Program through a partnership with the New York State Department of Environmental Conservation's Office of Invasive Species Coordination with funding provided by the New York State Environmental Protection Fund.

www.imapinvasives.org



Overview

In this lesson, students learn about the ecological threats caused by invasive species and take action by surveying for invasive species in their community. As citizen scientists, they will learn to recognize the signs of selected species and then head outside to collect data using spatial technology. The data collected by students will be reported to professionals who are charged with controlling invasive species.

Objectives

1. Increase student awareness of the impact of invasive species
2. Learn how to collect field data from visual surveys
3. Use geospatial technology to report their findings, including online maps and GPS devices
4. Enhance the students' observation skills by using resources such as dichotomous keys and field guides to identify invasive species

Setting

- Urban green space close to your high school (school grounds, local park or even street lined with planted trees)
- Computer lab
- Classroom

Time Needed

- 1 day for preparation
- 3 to 4 total class periods for teaching:
 - 1 period: Classroom introduction to invasive species, identification
 - 1 to 2 extended periods: Outside data collection
 - 1 period: In computer lab to enter data

Citizen Science Lesson

Invasive Species Tracking

By Jennifer Dean

SUBJECTS

Biological/Life Science
Earth Science
Technology



*Community
& Sustainability*



plants

Glossary Terms:

Invasive Species
Dichotomous Key

Invasive species are non-native organisms that cause harm to ecosystems, the economy or human health. In urban settings, some invasive insects pose a major threat to the trees that we depend on to cool our cities and provide clean air. Invasive plants can counteract efforts to maintain and vitalize green spaces for use by urban wildlife and enjoyment of people. Catching new invasive species early is key to effective control, and professionals rely on reports from the public to help them. Students can make important contributions to their community as citizen scientists by learning to identify and report invasive species.

*Although geared towards the Pacific Northwest, this site has a nice explanation of what makes a species invasive: www.fs.fed.us/pnw/invasives/

There are two different routes a class can take with an invasive species mapping project:

1. **Host Tree Surveys** to look for damage signs of invasive insects.
2. **Mapping Invasive Plants**

Host Tree Surveys

(The example below focuses on the Asian Longhorned Beetle, but could be modified for other insect species)

Overview

Students will learn the damage signs of invasive insect pests and then inspect trees around their school grounds or along nearby streets. Data will be recorded about tree location and damage signs (dying limbs, leaf damage, exit holes from the bark, etc.). This citizen science data will be reported to professionals who are charged with controlling invasive species.

Background Information

Some invasive insects, such as the Asian Longhorned Beetle (ALB) and the Goldspotted Oak Borer, pose a major threat to the trees that we depend on to cool our cities and provide clean air. These pests are hard to spot, but the damage they leave behind on their woody victims can be very distinctive.



© Kenneth R. Law, USDA APHIS PPQ

Impacts of ALB on street trees: Before and after discovery of ALB in Worcester, Mass.

The Asian Longhorned Beetle is a wood-feeding insect that is native to Asia, but has hitched a ride to other parts of the world in the wood used to make crates and pallets for the many goods that are

exported. Unlike in their native range, ALBs here in the U.S. do not have natural predators to help keep their populations down, and many native tree species are not resistant to this insect. The ALB feeds on a wide variety of host trees, including maples. Infested trees usually die within a few years, during which the beetles continue to spread to other nearby trees. The beetles can be spread quickly over long distances as people move infested logs, such as when someone takes firewood and goes camping. It is important to watch for the signs of ALB-infested trees to catch new infestations early, and just as important to inspect trees and report where you did NOT find signs of damage.

Urban Relevance

We depend on urban trees to cool our cities and clean the air we breathe, in addition to providing food and shelter for wildlife and aesthetic value. Also, large tracks of forest outside of cities often protect the watersheds that supply our drinking water. To further explore the value of trees, visit the Davey Tree Benefit Calculator: www.davey.com/ask-the-expert/arborist-advice/tree-calculator/national-tree-benefit-calculator.

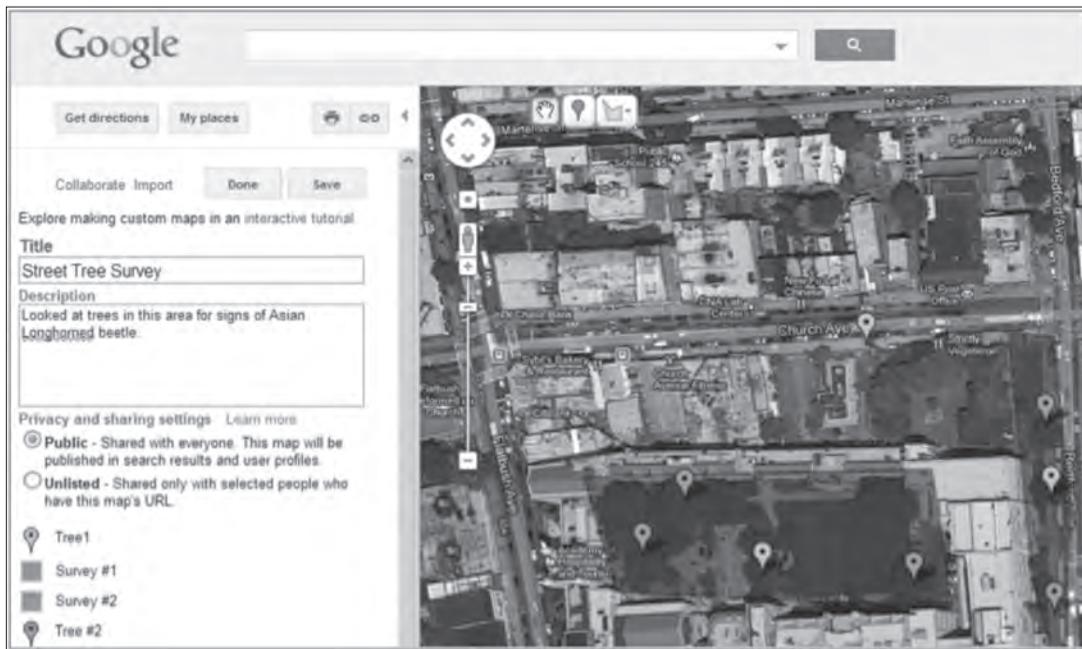
Materials

- Computer with Internet access
- Digital camera (or phone camera)
- Binoculars
- Data forms
- Maps of the area to inspect trees
- GPS or smartphone with Compass app (optional)
- Field guides or handouts of damage signs
- Jar to collect beetles

Procedure

1. *Contact your city/state invasive species outreach program, often through the state department of agriculture or environmental protection or county extension office.* Let the appropriate person know you are planning to do tree surveys for ALBs with your students. Ask them where you can report your class data (all citizen science surveys are very valuable!) and if they have any educational resources (like pieces of wood with damage marks and identification guides) that you can borrow.
2. *Explain the damage signs of ALBs.* The Massachusetts Department of Agricultural Resources has a great page of educational materials, including PowerPoint slides showing the signs of ALBs (<http://massnrc.org/pests/alb/albmedia.htm#K-12>). You can also show slides of some common host trees (such as maple, sycamore, poplar and willow). There are many informative online guides to tree identification, for example, the City of New York Parks & Recreation Urban Tree guide: www.nycgovparks.org/sub_your_park/trees_greenstreets/treescount/2005_Census_Leaf_Key_Final.pdf.
3. *Determine how to map your survey locations.* If you are focusing on street trees, it may be enough simply to provide addresses and intersections. But if you would like to introduce spatial technology, you can use GPS units or online maps.

- **GPS units** – if you have access to units, you can use them to determine the coordinates while you are out collecting data. Most smartphones will also have an internal GPS device, although not as accurate as a standalone GPS unit. You can get a compass app that will display your current coordinates.
- **Online maps** – Google Maps has many features that will be helpful to finding your locations, including satellite imagery. You can print out maps ahead of time and then mark the locations as you go. If you have a Google account, you can sign into Maps, and create project maps by adding points and polygons with descriptions. See www.google.com/edu/resources/maps.html for more information about using Google Maps for education.



Creating a custom map in Google Maps.

4. *Decide where to survey trees.* You can survey around your school, along tree-lined streets or in a local city park.
5. *Head outside and collect data.* General data forms for host tree surveys are attached to this lesson, or your city contact may have a specific form for you to use. The important information to collect includes: who, where, when, what you are looking for and whether or not you see damage signs on trees surveyed. The size of the tree is also important and is commonly measured as "Diameter at Breast Height" (DBH). This measurement of the width of the tree is taken at 4.5 feet above the ground. It is also helpful to record the tree species if you know them. Binoculars are very useful when looking up and down the branches for damage signs. Bring along a digital camera or phone with a camera to take photos of damage and a jar to catch any suspicious-looking beetles. Stress to your students the importance of collecting accurate data. Their data is most helpful if they review their coordinates carefully and make sure the required data is being completed in the correct sections of the forms.

6. *Report your findings.* As citizen scientists, your data is very important and contributes to the overall efforts of controlling invasive species. If you are in a state using iMapInvasives, you can enter your tree survey data directly online (contact the state administrator to get your account created and for more details). In other states, you can send copies of the data sheets to the pest outreach program. You could also create a custom map on Google Maps to show where you have surveyed.

Mapping Invasive Plants

Overview

Students will learn about the effects of invasive species, the identifying traits of some common invasive plants, and a method for recording data in the field. This citizen science data will be reported as points on online maps and will help professionals who are charged with controlling invasive species. This project is ideal for a designated green space, such as a city park.

Urban Relevance

Plants are considered invasive if they are not native to the area AND are causing harm to the ecosystem, the economy or human health. In urban landscapes, invasive plants can counteract efforts to maintain and vitalize green spaces for use by urban wildlife and people, and some species can cause economic harm by damaging structures or clogging water intake pipes.

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LEAF intern Alejandra Bautista helps remove invasive plants in California.

Materials

- Computer with Internet access
- Digital camera (or phone camera)
- Data forms
- Maps of the area to inspect trees
- GPS or smartphone with Compass app (optional)
- Field guides or handouts of invasive plants

Procedure

1. *Decide which plant species to focus on and learn the identifying traits.* Some tips:
 - Start small. You don't want to overwhelm the students with too many species at once. Pick a few common, easy to identify invasive plants. To decide which species to focus on for your area, contact your local Cooperative Extension office: www.csrees.usda.gov/Extension/.
 - Scout out the area ahead of time to see what species your class will encounter.
 - Use one or more of the free, online identification guides for invasive species. A compilation of links can be found on the iMapInvasives site: www.imapinvasives.org/links#id_guide
 - If you need help becoming familiar with the local plants, team up with a local expert. Check with your county extension office for contact information for Master Gardeners in the area.
2. *Introduce your class to the problem of invasive species and the selected plant species.*
3. Determine how to map your locations (see #3 in Host Tree Surveys above).
4. *Head outside and collect data.* General data forms for reporting invasive plants are attached to this lesson, or you can make your own. The important information to collect includes: who (observer), where (coordinates), when and what you found. Take photos of the identifying characteristics of the plants you find to upload with the reports (hold a piece of paper next to the plant listing the location so you can easily tell when looking back at all the photos you took). Stress to your students the importance of collecting accurate data. Their data is most helpful if they review their coordinates carefully and make sure the required data is being completed in the correct sections of the forms.
5. *Report your findings.* As citizen scientists, your data is very important and contributes to the overall efforts of controlling invasive species. If you are in a state using iMapInvasives, you can enter your reports online or from the field with a smartphone (contact the state administrator to get your account created and for more details). In other states, you can enter the locations online into EDDMaps (www.eddmaps.org/report/).

Assessment

One form of assessment is the accurate and thorough completion of data collection forms and the successful reporting of findings. Another possibility (recommended) is a two- to three-page summary report that includes the goals of the project, the methodology used, a summary of the data and a conclusion in which students show evidence of understanding what invasive species are and what their impact can be on the local ecology. Other assessments can be developed as needed by the teacher.

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LEAF Students measure a tree's DBH.

iMapInvasives Field Form SURVEY

BASIC SURVEY FIELDS

(*Required fields)

Survey Goal* (select one) 1) find potential ED/RR locations 2) find new infestations 3) pre-treatment survey 4) post-treatment survey	Lead Contact*	Project Name
Targeted Species* (Circle if species detected)		
Survey Start Date*		
Survey End Date*		

ADVANCED SURVEY FIELDS

Who	Organization Survey Crew - Names	Address or Location Description
		Land Ownership public / private / NGO / other
		Land Use Ag / Forest / Suburban / Urban / Mixed
		Land Use Comments
		Site Name
	Total Survey Person Hours (# people x # hours)	Where

What	Did you see the target species: YES / NO	General Survey Comments
	If yes, resulting Observation ID#s	

Remember to take photos to upload to iMapInvasives.

